

(57) [Abstract]

[Problems]

To univocally interpret the meaning of a natural language sentence related to inputted voice information and to generate a response sentence.

[Solving Means]

A voice interactive processing system 1 interpreting the meaning of data obtained by recognizing voice information, generating a response sentence, and outputting the generated response sentence. This system includes a voice information input section 2 inputting the voice information; a voice recognition processing S1 of a CPU 3 recognizing the inputted voice information, and extracting self-contained word candidates included in the voice information as a sequence of words having an order relationship among one another; a part-of-speech sequence pattern dictionary file F3 and a part-of-speed sequence hash dictionary file F4 of a memory 4 storing acceptable sentence patterns as a plurality of part-of-speech sequence patterns; a construction analysis processing S2 of the CPU 3 collating the extracted word sequence with the plurality of part-of-speech sequence patterns, and thereby obtaining a word sequence corresponding to at least one part-of-speech sequence pattern as a sentence candidate sequence corresponding to the voice information; and an annexed word

complementary processing S3 of the CPU 3 complementing the obtained sentence candidate sequence by an annexed word, and thereby generating natural language sentence construction data for meaning interpretation.

[What is claimed is]

[Claim 1]

A voice interactive processing system interpreting the meaning of data obtained by recognizing voice information to generate a response sentence and outputting the generated response sentence, comprising: voice information inputting means of inputting said voice information; extracting means of recognizing the inputted voice information, and extracting self-contained word candidates included in said voice information as a sequence of words having an order relationship among one another; part-of-speech pattern storing means of storing acceptable sentence patterns as a plurality of part-of-speech sequence patterns; means for collating the extracted word sequence with said plurality of part-of-speech sequence patterns, and thereby obtaining a word sequence corresponding to at least one part-of-speech sequence pattern as a sentence candidate sequence corresponding to said voice information; natural language sentence construction data generating means of complementing the obtained sentence candidate sequence by an annexed word, and thereby generating

said natural language sentence construction data for said meaning interpretation.

[Claim 2]

The voice interactive processing system according to claim 1, wherein said natural language sentence construction data generating means comprises: annexed word storing means of previously storing an annexed word related to at least one part of speech of each of said plurality of part-of-speech sequence patterns; and means of reading the annexed word corresponding to the part-of-speech sequence pattern of said sentence candidate sequence from said annexed word storing means, complementing said at least one part of speech by the read annexed word, and generating said natural language sentence construction data.

[Claim 3]

The voice interactive processing system according to claim 1 or 2, comprising: meaning interpreting means, having a knowledge base, of interpreting the meaning of said natural language sentence construction data while referring to the knowledge base; response sentence data generating means of generating response sentence data on said voice information based on a content of meaning interpretation; and voice information outputting means of outputting the generated response sentence data as the voice information.

[Claim 4]

The voice interactive processing system according to claim

3, wherein said response sentence data generating means is means of generating the response sentence data including the natural language sentence construction generated by said natural language sentence construction data generation means in addition to said content of the meaning interpretation.

[Claim 5]

The voice interactive processing system according to claim 3 or 4, wherein said natural language sentence construction data generating means includes means of generating a plurality of items of natural language structure data different in natural language sentence construction for the obtained sentence candidate sequence.

[Claim 6]

The voice interactive processing system according to claim 5, wherein said meaning interpreting means includes selecting and meaning interpreting means of selecting one natural language sentence construction data having a probable meaning from the generated plurality of items of natural language sentence construction data based on predetermined determination information, and interpreting the meaning of the selected natural language sentence construction data while referring to said knowledge base.

[Claim 7]

A voice interactive processing method for interpreting the meaning of data obtained by recognizing voice information

of part-of-speech sequence patterns in a memory; means of allowing said computer to collate the extracted word sequence with said plurality of part-of-speech sequence patterns, and to thereby obtain a word sequence corresponding to at least one part-of-speech sequence pattern as a sentence candidate sequence corresponding to said voice information; means of allowing said computer to complement the obtained sentence candidate sequence by an annexed word, and to thereby generate said natural language sentence construction data for said meaning interpretation.

[図訳]

- 1: voice information
- 2: voice input section
- 3: voice recognition processing
- 4: construction analysis processing
- 5: annexed word complementary processing
- 6: response information
- 7: voice output section
- 8: voice synthetic processing
- 9: response sentence generating processing
- 10: meaning analysis and problem solving processing
- 11: part-of-speech dictionary file
- 12: sentence pattern dictionary file
- 13: part-of-speech sequence pattern dictionary file
- 14: part-of-speech sequence hash language file
- 15: node element data file
- 16: part-of-speech sequence candidate list file
- 17: node-being-processed list file
- 18: annexed word complementary file
- 19: knowledge base
- 20: voice interactive processing program
- 21: example of sentence pattern language
- 22: g1: (location)|(name of location en route)(location en route)|(pronoun: pronominal location
<there>))-[(itinerary)]-((interrogative: HOW_MUCH>(how

much)| (interrogative: HOW_MUCH time)| (interrogative):
 HOW_MUCH distance))
 g2: ((location proper noun: location name)| (name of location
 en route) (location en route))-(interrogative: WHAT: WHAT
 object)-((mark)| (location: facilities <to eat>))- (operation:
 existent: normally existent)
 23: (node element data on each node of word lattice)
 24: node ID, belonging part of speech, previous node list, next
 node list, unprocessed previous node list, analysis status list,
 input element ID: word expression
 25: node element data on node (14: interchange) when steps 510
 to 513 are finished
 26: node ID, belonging part of speech, previous node list, next
 node list, unprocessed previous node list, analysis status list,
 14: interchange, route (07: present, 03: Nishinomiya), (18
 present, 20 to), (07 present, 03 Nishinomiya)
 27: start meaning analysis and problem solving processing
 28: interpret meaning of natural language sentence construction
 data
 29: generate response sentence in response to meaning interpreted
 while referring to knowledge base D
 30: return
 31: example of part-of-speech dictionary
 32: location
 33: present location

34: facilities
35: destination
36: location en route
37: facility connected
38: facility unconnected
39: station
40: shop
41: hotel
42: inter
43: interchange
44: exit/entrance
45: Hukae exit
46: Uozaki entrance
47: example of part-of-speech sequence pattern dictionary
48: location, interrogative, HOW_MUCH, how much
49: location, itinerary, interrogative, HOW_MUCH, how much
50: location, interrogative, HOW_MUCH time (how long)
51: location, itinerary, interrogative, HOW_MUCH time (how long)
52: location, interrogative, HOW_MUCH distance (how far)
53: location, itinerary, interrogative, HOW_MUCH distance (how far)
54: name of location en route, location en route, interrogative, HOW_MUCH (how much)
55: name of location en route, location en route, itinerary, interrogative, HOW_MUCH (how much)

56: name of location en route, location en route, interrogative,
HOW_MUCH time (how long)

57: name of location en route, location en route, itinerary,
interrogative, HOW_MUCH time (how long)

58: name of location en route, location en route, interrogative,
HOW_MUCH distance (how far)

59: name of location en route, location en route, itinerary,
interrogative, HOW_MUCH distance (how far)

60: pronoun, pronominal location, (there), interrogative,
HOW_MUCH (how much)

61: pronoun, pronominal location, (there), interrogative,
interrogative, HOW_MUCH (how much)

62: pronoun, pronominal location, (there), interrogative,
HOW_MUCH time (how long)

63: pronoun, pronominal location, (there), itinerary,
interrogative, HOW_MUCH time (how long)

64: pronoun, pronominal location, (there), interrogative,
HOW_MUCH distance (how far)

65: pronoun, pronominal location, (there), itinerary,
interrogative, HOW_MUCH distance (how far)

66: location proper noun, location name, interrogative,
WHAT:WHAT object, mark, operation, existent, normally existent

67: location proper noun, location name, interrogative,
WHAT:WHAT object, location, facilities, (to eat), operation,
existent, normally existent

68: name of location en route, location en route, interrogative,
WHAT:WHAT object, mark, operation, existent, normally existent

69: name of location en route, location en route, interrogative,
WHAT:WHAT object, location, facilities, (to eat), operation,
existent, normally existent

70: name of location en route, location en route, adjective,
(next), condition, location: facilities

71: example of simplified word spotting result

72: input voice: "how much time, distance (how far, how long)
is it to Nishinomiya Interchange?", route, Nishinomiya, present,
inter, interchange, present, to, how much (how far, how long)

73: start annexed word complementary processing

74: refer to annexed word complementary file F3

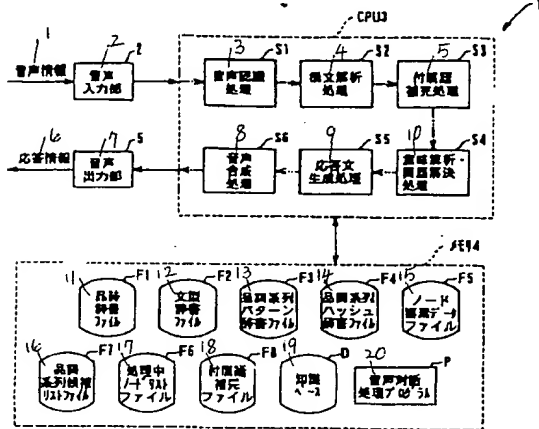
75: read complementary information on generated keyword sequence
from file F3

76: complement keyword sequence by annexed word based on
complementary information

77: return

図面

【図1】



【図3】

(文型辞書の例) 21

- ※ 1 : ((場所) | (経由地名) (経由地) | (代名詞: 代名詞場所(そこ))) - ((道筋) - ((疑問詞: HOW MUCH(どれくらい)) | (疑問詞: HOW MUCH(何)) | (疑問詞: HOW MUCH(何))
- ※ 2 : ((場所固有名称: 地名) | (経由地名) (経由地) - (疑問詞: WHAT: WHAT(何)) - ((目印) | (場所: 施設(食べるところ))) - (動作: 存在: 存在(通常))

【図8】

(辞書ラティスの各ノードのノード認識データ) 23

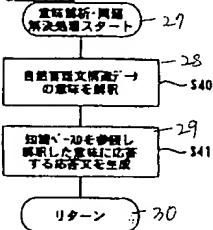
ノードID	入力要素ID: 単語認識
所属辞書	
親ノードID	
次ノードID	
未知語種ノードID	
解析途中経過ID	

【図11】

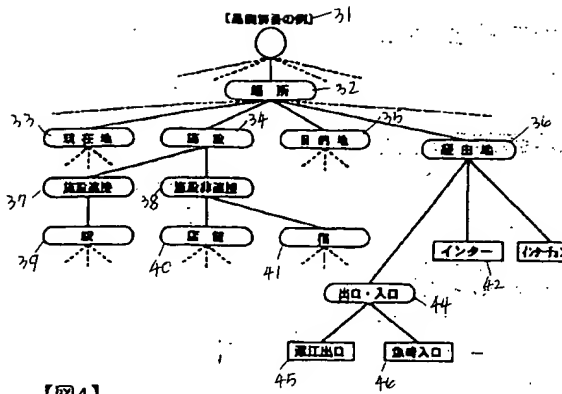
(5/7 310-311終了時のノード (14:0+) のノード認識データ) 25

ノードID	14: インター
所属辞書	経由地
親ノードID	{07: 09: 01: 高直}
次ノードID	{18: 09: 10: 高直}
未知語種ノードID	{07: 09: 01: 高直}
解析途中経過ID	0

【図13】



【図2】



【图4】

【品別系列ボタン辞書の例】

[illegible]

【图6】

【標準化された「た」の「た」の例】——71

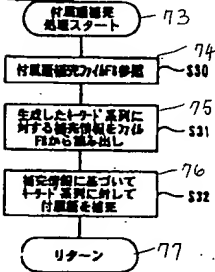
入力番号: 「にしのみやいんたーちあんじまでどのくらいですか」

国 (7. 150000) 0-3
都 (7. 100000) 0-3
市 (7. 000000) 0-3

イン (7. 500000) 10-14
イン (7. 450000) 10-20
市 (7. 323333) 20-22
市 (7. 000000) 21-24

まで どのくらい (L 556667) 25-32

【圖12】



【圖5】

A

[品詞系列パターン辞書の例]—47

- sp01-g1: (場所) (疑問詞: HOW MUCH<どれくらい>) — 48
 sp02-g1: (場所) (道程) (疑問詞: HOW MUCH<どれくらい>) — 49
 sp03-g1: (場所) (疑問詞: HOW MUCH時間) — 50
 sp04-g1: (場所) (道程) (疑問詞: HOW MUCH時間) — 51
 sp05-g1: (場所) (疑問詞: HOW MUCH距離) — 52
 sp06-g1: (場所) (道程) (疑問詞: HOW MUCH距離) — 53
 sp07-g1: (経由地名) (経由地) (疑問詞: HOW MUCH<どれくらい>) — 54
 sp08-g1: (経由地名) (経由地) (道程) (疑問詞: HOW MUCH<どれくらい>) — 55
 sp09-g1: (経由地名) (経由地) (疑問詞: HOW MUCH時間) — 56
 sp10-g1: (経由地名) (経由地) (道程) (疑問詞: HOW MUCH時間) — 57
 sp11-g1: (経由地名) (経由地) (疑問詞: HOW MUCH距離) — 58
 sp12-g1: (経由地名) (経由地) (道程) (疑問詞: HOW MUCH距離) — 59
 sp13-g1: (代名詞: 代名詞場所 <そこ>) (疑問詞: HOW MUCH<どれくらい>) — 60
 sp14-g1: (代名詞: 代名詞場所 <そこ>) (道程) (疑問詞: HOW MUCH<どれくらい>) — 61
 sp15-g1: (代名詞: 代名詞場所 <そこ>) (疑問詞: HOW MUCH時間) — 62
 sp16-g1: (代名詞: 代名詞場所 <そこ>) (道程) (疑問詞: HOW MUCH時間) — 63
 sp17-g1: (代名詞: 代名詞場所 <そこ>) (疑問詞: HOW MUCH距離) — 64
 sp18-g1: (代名詞: 代名詞場所 <そこ>) (道程) (疑問詞: HOW MUCH距離) — 65
 sp01-g2: (場所固有名詞: 地名) (疑問詞: WHAT: WHAT物) (目印) (動作: 存在: 存在通常) — 66
 sp02-g2: (場所固有名詞: 地名) (疑問詞: WHAT: WHAT物) (場所: 施設<食べるところ>) (動作: 存在: 存在通常) — 67
 sp03-g2: (経由地名) (経由地) (疑問詞: WHAT: WHAT物) (目印) (動作: 存在: 存在通常) — 68
 sp04-g2: (経由地名) (経由地) (疑問詞: WHAT: WHAT物) (場所: 施設<食べるところ>) (動作: 存在: 存在通常) — 69
 SPOX-gy: (経由地名) (経由地) (形容詞: <次>) (条件) (場所: 施設) — 70